FACULTY OF HEALTH SCIENCES AND SPORTS

BACHELOR OF SCIENCE IN BIOMEDICAL TECHNOLOGY (PHARMACY TECHNOLOGY)

LEARNING MODULE OUTLINE

Academic Year	2023-2024	Semester	1
Module Code	BSPY2101		
Learning Module	Pharmacology I		
Pre-requisite(s)	Nil		
Medium of Instruction	Chinese & English		
Credits	6	Contact Hours	90
Instructor	Dr. Tao Yi, Aaron	Email	yitao@mpu.edu.mo
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MODULE DESCRIPTION

This 90-hour course is the first in a series of courses that equip students with pharmacological knowledge. The course systemically introduces mechanisms of action, pharmacological effects, clinical indications, drug interactions and adverse effects of various drug classes.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

On completion of this learning module, students will be able to:

M1.	Demonstrate an understanding of the basic concepts of pharmacology.
M2.	Analyse and interpret the relationship among mechanisms of action, therapeutic effects and adverse effects of different drugs.
M3.	Describe the classification, clinical indications, mechanism of actions, and significant adverse effects of commonly used drugs.
M4.	Apply pharmacology knowledge to analyse and interpret clinical cases.
M5.	Demonstrate an understanding of the relationship between disease characteristics and pharmacological effects.
M6.	Communicate scientific concepts effectively through oral presentations, demonstrating comprehension of pharmacology principles.

These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

PILOs	M1	M2	M3	M4	M5	M6
P1. To demonstrate understanding of a range of subjects, fields, principles and approaches relevant to pharmacy technology	✓	✓	✓	✓	✓	✓
P2. To demonstrate understanding of theories, analytical approaches and practices that underpin pharmacy operations and management	✓	✓	✓	✓	✓	✓
P3. To demonstrate understanding of major trends and issues related to pharmacy technology	✓			✓	✓	✓
P4. To apply professional knowledge and skills to analyse, interpret and solve problems, challenges and risks in pharmacy practice	✓	✓	✓	✓	✓	
P5. To critically appraise and interpret scientific and clinical literature and apply evidence-based practice	✓	✓		✓	✓	✓
P6. To acquire and apply research skills in pharmacy technology		✓		✓		✓
P7. To demonstrate effective communication and teamwork skills						✓
P8. To maintain professional and ethical standards in pharmacy practice and research	✓	✓	✓	✓	✓	✓

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
1	1. Introduction to pharmacology (3 hours) 1.1 General principles 1.2 Pharmacodynamics 1.3 Pharmacokinetics 1.4 The roles of Pharmacology 1.5 Sources of drugs 1.6 How to learn Pharmacology	3
2	2. Pharmacokinetics (6 hours) 2.1 Routes of drug administration 2.2 Drug permeation across membranes 2.3 Absorption 2.4 Distribution 2.5 Biotransformation 2.6 Excretion 2.7 Elimination 2.8 Design and optimization of dosage regimen	6
3	3. Drug-receptor interactions and pharmacodynamics (3 hours) 3.1 Mechanism of action of drugs 3.2 Drug receptor 3.3 Dose-response relationship 3.4 Classification of drugs binding to receptor 4. The autonomic nervous system (3 hours) 4.1 Overview 4.2 Introduction to the nervous system	6

	4.3 Chemical signaling between cells 4.4 Signal transduction in the effector cell	
4	5. Cholinergic agonists (4 hours) 5.1 Classification of ANS Drugs 5.2 The cholinergic neuron 5.3 Cholinergic receptors (cholinoceptors) 5.4 Direct-acting cholinergic agonists 5.5 Indirect-acting cholinergic agonists: anticholinesterase agents (reversible) 5.6 Indirect-acting cholinergic agonists: anticholinesterase agents (irreversible) 5.7 Toxicology of anticholinesterase agents 6. Cholinergic antagonists (2 hours) 6.1 Overview 6.2 Antimuscarinic agents 6.3 Ganglionic blockers 6.4 Neuromuscular-blocking agents	6
5	7. Adrenergic agonists (3 hours) 7.1 Overview 7.2 The adrenergic neuron 7.3 Characteristics of adrenergic agonists 7.4 Direct-acting adrenergic agonists 7.5 Indirect-acting adrenergic agonists 7.6 Mixed-action adrenergic agonists 8. Adrenergic antagonists (3 hours) 8.1 Overview 8.2 α-adrenergic blocking agents 8.3 β-adrenergic blocking agents 8.4 Drugs affecting neurotransmitter release or uptake	6
6	**9. Test I (2 hours)** 10. Drugs for neurodegenerative diseases (3 hours) 10.1 Overview 10.2 Neurotransmission in the CNS 10.3 Synaptic potentials 10.4 Overview of Parkinson's disease 10.5 Drugs used in Parkinson's disease 10.6 Drugs used in Alzheimer disease 10.7 Drugs used in multiple sclerosis 10.8 Drugs used in amyotrophic lateral sclerosis 11. Anxiolytic and hypnotic drugs (3 hours) 11.1 Overview 11.2 Benzodiazepines 11.3 Benzodiazepine antagonist 11.4 Other anxiolytic agents 11.5 Barbiturates 11.6 Other hypnotic agents	8

8	12. Antidepressants (4 hours) 12.1 Overview 12.2 Mechanism of antidepressant drugs 12.3 Selective serotonin reuptake inhibitors 12.4 Serotonin/norepinephrine reuptake inhibitors 12.5 Atypical antidepressants 12.6 Tricyclic antidepressants 12.7 Monoamine oxidase inhibitors 12.8 Treatment of mania and bipolar disorder 13. Antipsychotic drugs (3 hours) 13.1 Overview 13.2 Schizophrenia 13.3 Antipsychotic drugs	7
9	14. Drugs for Epilepsy (3 hours) 14.1 Overview 14.2 Etiology of seizures 14.3 Classification of seizures 14.4 Drug selection 14.5 Antiepilepsy medications 14.6 Status epilepticus 14.7 Women's health and epilepsy 15. Anesthetics (3 hours) 15.1 Overview 15.2 Patient factors in selection of anesthesia 15.3 Stages and depth of anesthesia 15.4 Inhalation anesthetics 15.5 Intravenous anesthetics 15.6 Neuromuscular blockers 15.7 Local anesthetics	6
10	16. Opioids (3 hours) 16.1 Overview 16.2 Opioid receptors 16.3 Opioid agonists 16.4 Partial agonists and mixed agonist–antagonists 16.5 Other analgesics 16.6 Antagonists 17. CNS Stimulants (3 hours) 17.1 Overview 17.2 Psychomotor stimulants 17.3 Hallucinogens	6
11	**18. Test II (2 hours)** Review (1 hour)	3
12	19. Antihypertensives (4 hours) 19.1 Overview 19.2 Etiology of hypertension 19.3 Mechanisms for controlling blood pressure 19.4 Treatment strategies	6

	19.5 Diuretics 19.6 β-adrenoceptor-blocking agents 19.7 Ace inhibitors 19.8 Angiotensin ii receptor blockers 19.9 Renin inhibitor 19.10 Calcium channel blockers 19.11 α-adrenoceptor-blocking agents 19.12 α-/β-adrenoceptor-blocking agents 19.13 Centrally acting adrenergic drugs 19.14 Vasodilators 19.15 Hypertensive emergency 19.16 Resistant hypertension 19.17 Combination therapy 20. Diuretics (2 hours) 20.1 Overview 20.2 Normal regulation of fluid and electrolytes by the kidneys 20.3 Thiazides and related agents 20.4 Loop or high-ceiling diuretics 20.5 Potassium-sparing diuretics 20.6 Carbonic anhydrase inhibitor 20.7 Osmotic diuretics	
13	21. Drugs for heart failure (3 hours) 21.1 Overview 21.2 Physiology of muscle contraction 21.3 Inhibitors of the renin–angiotensin–aldosterone system 21.4 β-blockers 21.5 Diuretics 21.6 Vaso- and venodilators 21.7 Inotropic drugs 21.8 Order of therapy 22. Antiarrhythmics (3 hours) 22.1 Overview 22.2 Introduction to the arrhythmias 22.3 Class I antiarrhythmic drugs 22.4 Class II antiarrhythmic drugs 22.5 Class III antiarrhythmic drugs 22.6 Class IV antiarrhythmic drugs 22.7 Other antiarrhythmic drugs	6
14	23. Antianginal drugs (2 hours) 23.1 Overview 23.2 Types of angina 23.3 Treatment strategies 23.4 β-adrenergic blockers 23.5 Calcium channel blockers 23.6 Organic nitrates 23.7 Sodium channel blocker 24. Anticoagulants and Antiplatelet agents (5 hours) 24.1 Overview	7

	24.2 Thrombus versus embolus 24.3 Platelet response to vascular injury 24.4 Platelet aggregation inhibitors 24.5 Blood coagulation 24.6 Anticoagulants 24.7 Thrombolytic drugs 24.8 Drugs used to treat bleeding	
15	25. Drugs for hyperlipidemia (3 hours) 25.1 Overview 25.2 Treatment goals 25.3 Drugs for hyperlipidemia **26. Active learning and presentation (5 hours)** 26.1 Neurodegenerative disorders: Parkinson's disease, Alzheimer's disease, multiple sclerosis (MS), and amyotrophic lateral sclerosis (ALS) 26.2 Depression and mania 26.3 Schizophrenia 26.4 Epilepsy 26.5 Hypertension	8
16	**(4 hours)** 26.6 Heart failure 26.7 Arrhythmias 26.8 Angina pectoris 26.9 Thrombotic disorders: acute myocardial infarction (MI), deep vein thrombosis (DVT), pulmonary embolism (PE), and acute ischemic stroke 26.10 Hyperlipidemias	4
18	27. **Final (2 hours)**	2

TEACHING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
T1. Lectures with case studies and real-life examples	✓	✓	✓	✓	✓	
T2. Literature review and critical analysis	✓	✓	✓	✓	✓	✓
T3. Group discussion and presentations	✓	✓	✓	✓	✓	✓

ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Bachelor's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

ASSESSMENT

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	Weighting (%)	ILOs to be Assessed
A1. Presentation	5	M4, M5, M6
A2. In Class oral Tests	5	M1, M2, M3, M4, M5, M6
A3. Group discussions	5	M1, M2, M3, M4, M5, M6
A4. Test I	25	M1, M2, M3, M4, M5
A5. Test II	30	M1, M2, M3, M4, M5
A6. Final exam	30	M1, M2, M3, M4, M5

This learning module is graded on a 100-point scale, with 100 being the highest possible score and 50 being the passing score.

Any students scoring less than 35% of the total mark in the final examination will be given an "F" grade for the module even if the overall grade is 50% or higher.

The assessment will be conducted following the University's Assessment Strategy (see www.mpu.edu.mo/teaching_learning/en/assessment_strategy.php). Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

MARKING SCHEME

High grades will be awarded to work that demonstrates exceptional understanding and mastery of the subject matter and consistently exceeding expectations. The followings are the general assessment criteria for the assessment activities.

Assessment Activities	Assessment Criteria	Mark Ranges				
		88-100	73-87	58-72	50-57	<50
A1. Presentation	Demonstrate the ability to apply pharmacological knowledge to analyse and interpret clinical cases, understand the relationship between disease	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels

	characteristics and pharmacological effects, and communicate scientific concepts effectively through oral presentations					
A2. In Class oral Tests	Demonstrate the ability to answer questions on topics covered in the outline	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A3. Group discussions	Demonstrate the ability to apply pharmacological knowledge to analyse and interpret clinical cases, understand the relationship between disease characteristics and pharmacological effects, and communicate scientific concepts effectively through oral presentations	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A4. Test I	Demonstrate the ability to understand, identify, and apply appropriate pharmacological concepts, knowledge, and methods	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A5. Test II	Demonstrate the ability to understand, identify, and apply appropriate pharmacological concepts, knowledge, and methods	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A6. Final exam	Demonstrate the ability to understand, identify, and apply appropriate pharmacological concepts, knowledge, and methods	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels

REQUIRED READINGS

Karen Whalen, et al. 2023, Lippincott's illustrated reviews: pharmacology. 8th ed. Baltimore, MD: Lippincott Williams & Wilkins

REFERENCES

Katzung B, Masters S, Trevor A. 2015, Basic and clinical pharmacology. 13th ed. New York: McGraw-Hill Medical.
Brunton L, Chabner B, Knollman. 2011, Goodman and Gilman's the pharmacological basis of therapeutics. 12th ed. New York: McGraw-Hill Professional.
Lexicomp. 2017, *Drug information handbook: a clinically relevant resource for all healthcare professionals.* 26th ed. Lexi-Comp.
Joint Formulary Committee. 2017, *British National Formulary 73*. Pharmaceutical Press.

STUDENT FEEDBACK

At the end of every semester, students are invited to provide feedback on the learning module and the teaching arrangement through questionnaires. Your feedback is valuable for instructors to enhance the module and its delivery for future students. The instructor and programme coordinators will consider all feedback and respond with actions formally in the annual programme review.

ACADEMIC INTEGRITY

The Macao Polytechnic University requires students to have full commitment to academic integrity when engaging in research and academic activities. Violations of academic integrity, which include but are not limited to plagiarism, collusion, fabrication or falsification, repeated use of assignments and cheating in examinations, are considered as serious academic offenses and may lead to disciplinary actions. Students should read the relevant regulations and guidelines in the Student Handbook which is distributed upon the admission into the University, a copy of which can also be found at www.mpu.edu.mo/student_handbook/.